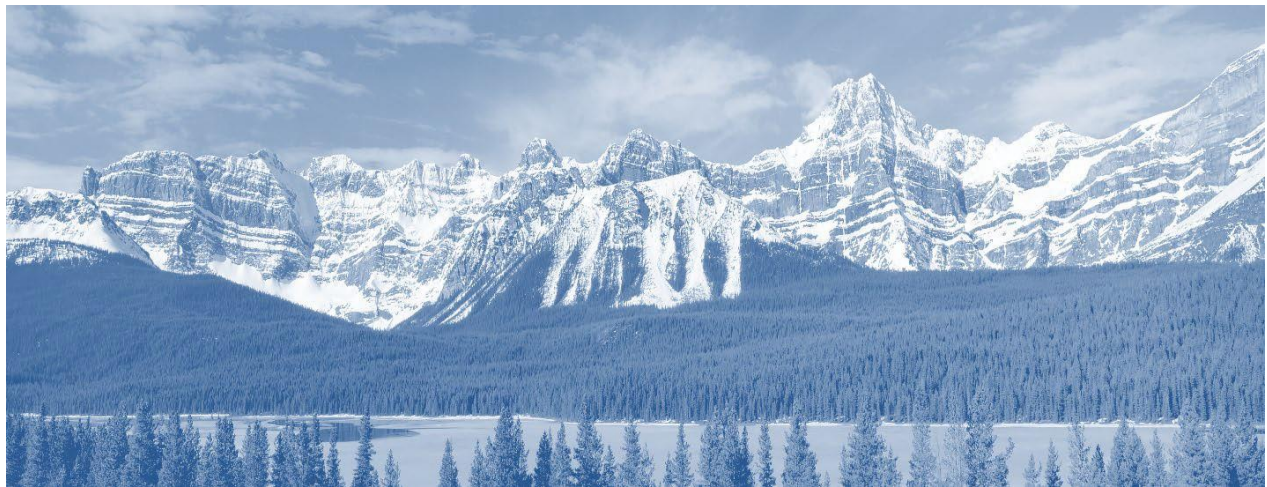


# ARLABnetwork

## AR Lab Network, Mountain Region Report 2021(Q3-Q4)-2022-2023 (Q1 – Q2)

Volume 2



Utah Department of Health and Human service  
Utah Public Health Laboratory Published November 2023

# Acknowledgements

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**Utah Public Health Laboratory**

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# Glossary

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## A

**AR**—Antimicrobial Resistance

**AR Lab Network**— Antimicrobial Resistance Laboratory Network

**AST**—Antimicrobial susceptibility testing

## B

**Big 5**—The ‘Big 5’ are the five main carbapenemases currently causing clinical problems in the United States that are targeted by the AR Lab Network. These carbapenemase enzymes include VIM, IMP, KPC, NDM, and OXA-48.

## C

**Cepheid<sup>®</sup> Carba-R**—A PCR-based test that screens for the ‘Big 5’ carbapenemases: VIM, IMP, KPC, NDM, and OXA-48

**CP-CRA**—Carbapenemase-positive carbapenem resistant *Acinetobacter*

**CP-CRE**—Carbapenemase-positive carbapenem-resistant Enterobacterales

**CP-CRPA**—Carbapenemase-positive carbapenem-resistant *Pseudomonas aeruginosa*

**CP-Gene**—Carbapenemase gene

**CP-mechanism**—Carbapenemase mechanism (mediated by identified carbapenemase encoding gene)

**CPO**—Carbapenemase-producing organisms

**CRAB**—Carbapenem-resistant *Acinetobacter baumannii*

## I

**IMP**—Imipenemase - one of the ‘Big 5’ carbapenemases

## K

**KPC**—*Klebsiella pneumoniae* carbapenemase - one of the ‘Big 5’ carbapenemases

## M

**MICs**—Minimum inhibitory concentrations. Defined as lowest concentration of a chemical, usually a drug, which prevents visible growth of a microorganism.

## N

**NDM**—New Delhi Metallo- $\beta$ -lactamase - one of the ‘Big 5’ carbapenemases

## O

**OXA**—Oxacillinase – OXA-48 is one of the ‘Big 5’ carbapenemases. Other oxacillinase carbapenemase mechanisms such as OXA-23-like and OXA-24-like are frequently found in CP-CRAB

## P

**PCR**—Polymerase Chain Reaction

## Q

**Q1**—First quarter **Q2**—Second quarter **Q3**—Third quarter **Q4**—Fourth quarter

## V

**VIM**—Verona Integron-encoded Metallo- $\beta$ -lactamase - one of the ‘Big 5’ carbapenemases

## W

**WGS**—Whole genome sequencing

# Foreword

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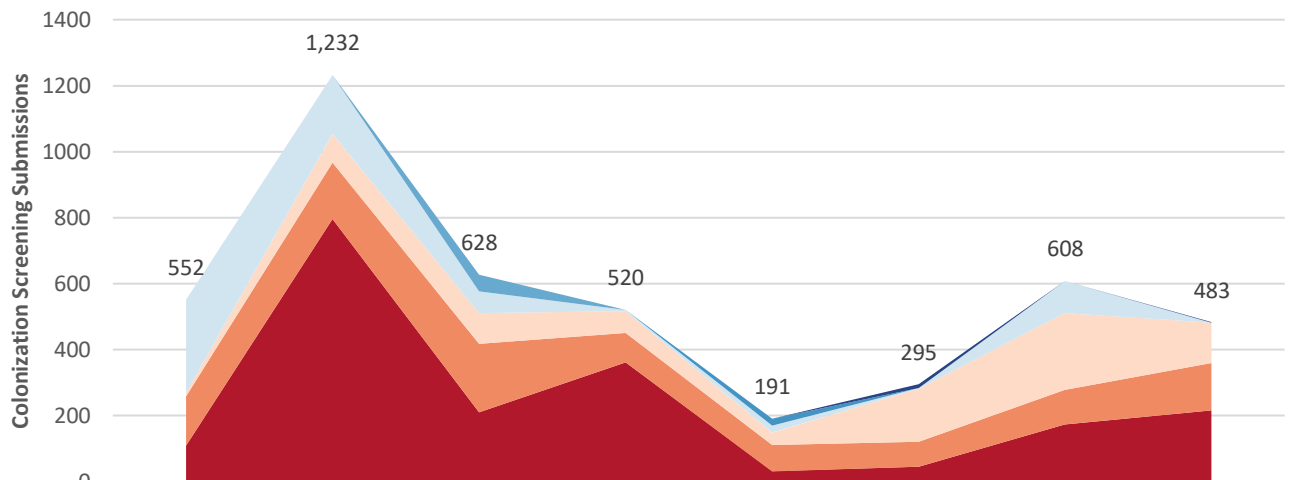
The Mountain Region Antimicrobial Resistance (AR) Lab Network report is a compilation of testing performed in 2021 last two quarters, all of 2022 and the first two quarters of 2023 at the Mountain Region AR Lab based in Utah. The Mountain Region AR Lab receives specimens from public health labs in eight states--Arizona, Colorado, Idaho, New Mexico, Utah, Wyoming, Montana, and Texas.

Summary tables and maps are presented that characterize colonization screening, isolate testing, and yeast isolate testing. This report displays numbers and keeps track of regional trends in these activities.

Please email [arlnutah@utah.gov](mailto:arlnutah@utah.gov) with suggestions for inclusion of datasets in future reports.



**Mountain Region total \*CPO colonization screening submissions—  
2021 (Q3 – Q4), 2022 (Q1 – Q4) and 2023 (Q1 – Q2)**



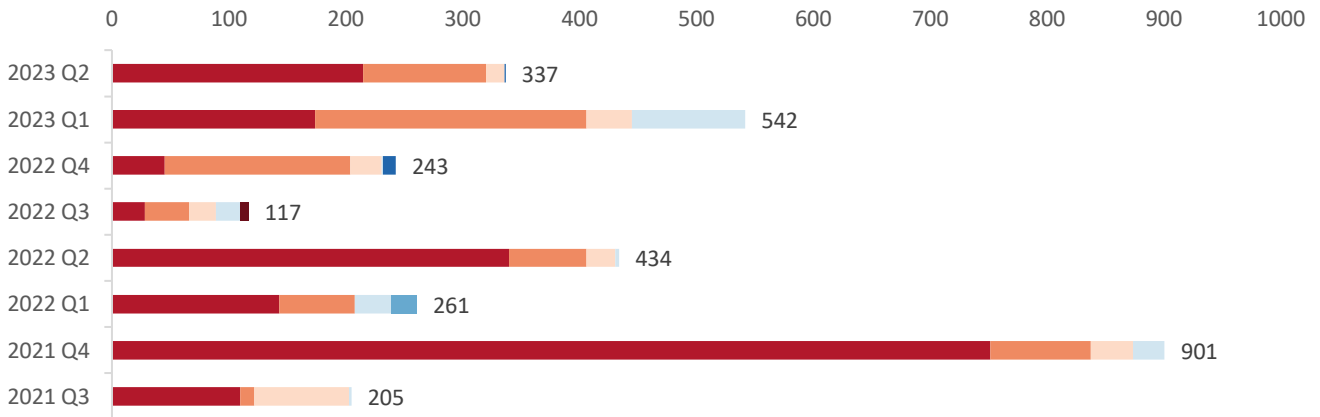
	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2
WY	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	11	0	1
MT	0	0	0	0	21	0	0	0
ID	0	0	51	0	0	0	0	0
TX	282	179	66	4	21	2	97	0
CO	12	86	93	66	38	160	233	123
UT	148	171	208	88	80	77	104	143
AZ	110	796	210	362	31	45	174	216
<b>Total</b>	<b>552</b>	<b>1232</b>	<b>628</b>	<b>520</b>	<b>191</b>	<b>295</b>	<b>608</b>	<b>483</b>

Submissions by State and Quarter

**Total submissions: 4,509**

*\*Includes colonization screening samples submitted to the Utah AR Lab for Cepheid<sup>R</sup> Carba-R PCR testing to identify CP-CRE and CP-CRPA and culture-based screening targeting CP- CRAB*

**Mountain Region CPO colonization sample submissions for Cepheid<sup>®</sup> Carba-R PCR testing for identification of CP-CRE and CP-CRPA by state—2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**



	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2
AZ	110	752	143	340	28	45	174	215
CO	12	86	65	66	38	159	232	105
UT	81	36	0	25	23	27	39	16
TX	2	27	31	3	21	1	97	0
ID	0	0	22	0	0	0	0	0
NM	0	0	0	0	0	11	0	1
MT	0	0	0	0	7	0	0	0
WY	0	0	0	0	0	0	0	0
Total	205	901	261	434	117	243	542	337

■ AZ ■ CO ■ UT ■ TX ■ ID ■ NM ■ MT ■ WY

**Total submissions: 3,040**

**Total positive results: 145 – 4.77% of submissions**

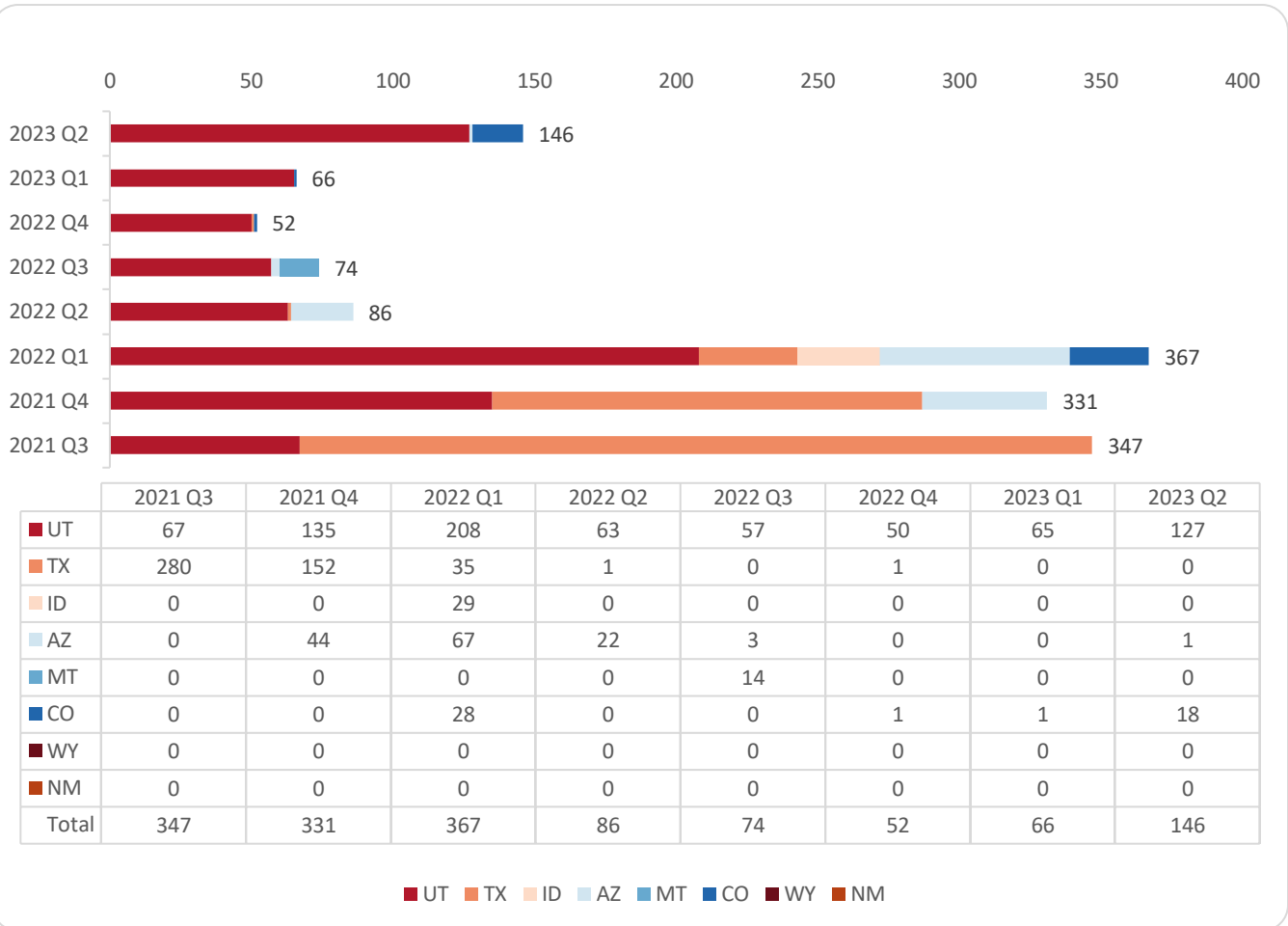
*\*Includes colonization screening samples submitted to the Utah AR Lab for Cepheid<sup>®</sup> Carba-R PCR testing to identify CP-CRE and CP-CRPA*



**Mountain Region positive carbapenemase mechanisms for CP-CRE  
and CP-CRPA isolates by State  
— 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**

	ORGANISM_NAME	MECHANISM	CNT
AZ	Citrobacter amalonaticus complex	KPC	1
AZ	Enterobacter cloacae complex	KPC	4
AZ	Enterobacter cloacae complex	NDM	3
AZ	Enterobacter cloacae complex	VIM	2
AZ	Escherichia coli	VIM	1
AZ	Klebsiella pneumoniae	KPC	9
AZ	Klebsiella pneumoniae	NDM	61
AZ	Leclercia adecarboxylata	VIM	1
AZ	Morganella morganii	VIM	1
CO	Citrobacter freundii complex	NDM	1
CO	Enterobacter cloacae complex	KPC	5
CO	Enterobacter cloacae complex	NDM	1
CO	Escherichia vulneris	KPC	1
CO	Klebsiella oxytoca	KPC	1
CO	Klebsiella pneumoniae	KPC	1
CO	Klebsiella pneumoniae	NDM	1
CO	Pseudomonas aeruginosa	NDM	1
ID	Pseudomonas aeruginosa	IMP	3
TX	Escherichia coli	KPC	1
TX	Escherichia coli	OXA-48	1
TX	Pseudomonas aeruginosa	VIM	1
UT	Enterobacter cloacae complex	KPC	2
UT	Escherichia coli	NDM	1
UT	Klebsiella pneumoniae	NDM	1
UT	Pseudomonas aeruginosa	VIM	3

**Mountain Region culture-based colonization screening submissions target CP-CRAB by State and quarter—2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**



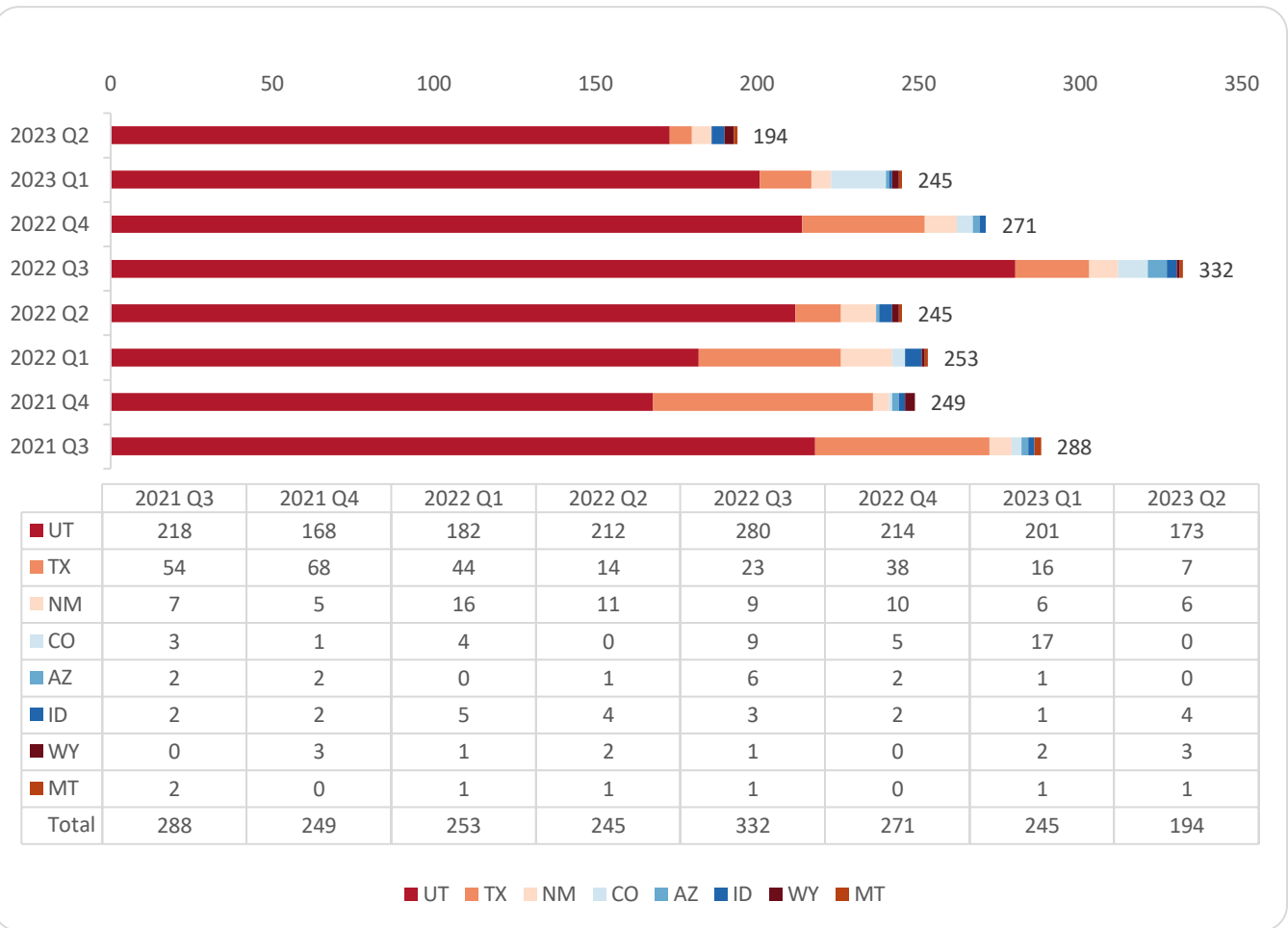
Total submissions: **1,469**

Total positive results: **81 – 5.51% of submissions**

**Mountain Region positive carbapenemase mechanisms for CP-CRAB isolates from colonization screening by State—2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**

	ORGANISM NAME	MECHANISM	COUNT
TX	Acinetobacter baumannii complex	OXA-23	3
UT	Acinetobacter baumannii complex	OXA-23	1
UT	Acinetobacter baumannii complex	OXA-235	4

**Mountain Region isolate submissions targeting CP-CRE and CP-CRPA by State and quarter —2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**



**Total submissions: 2,070**

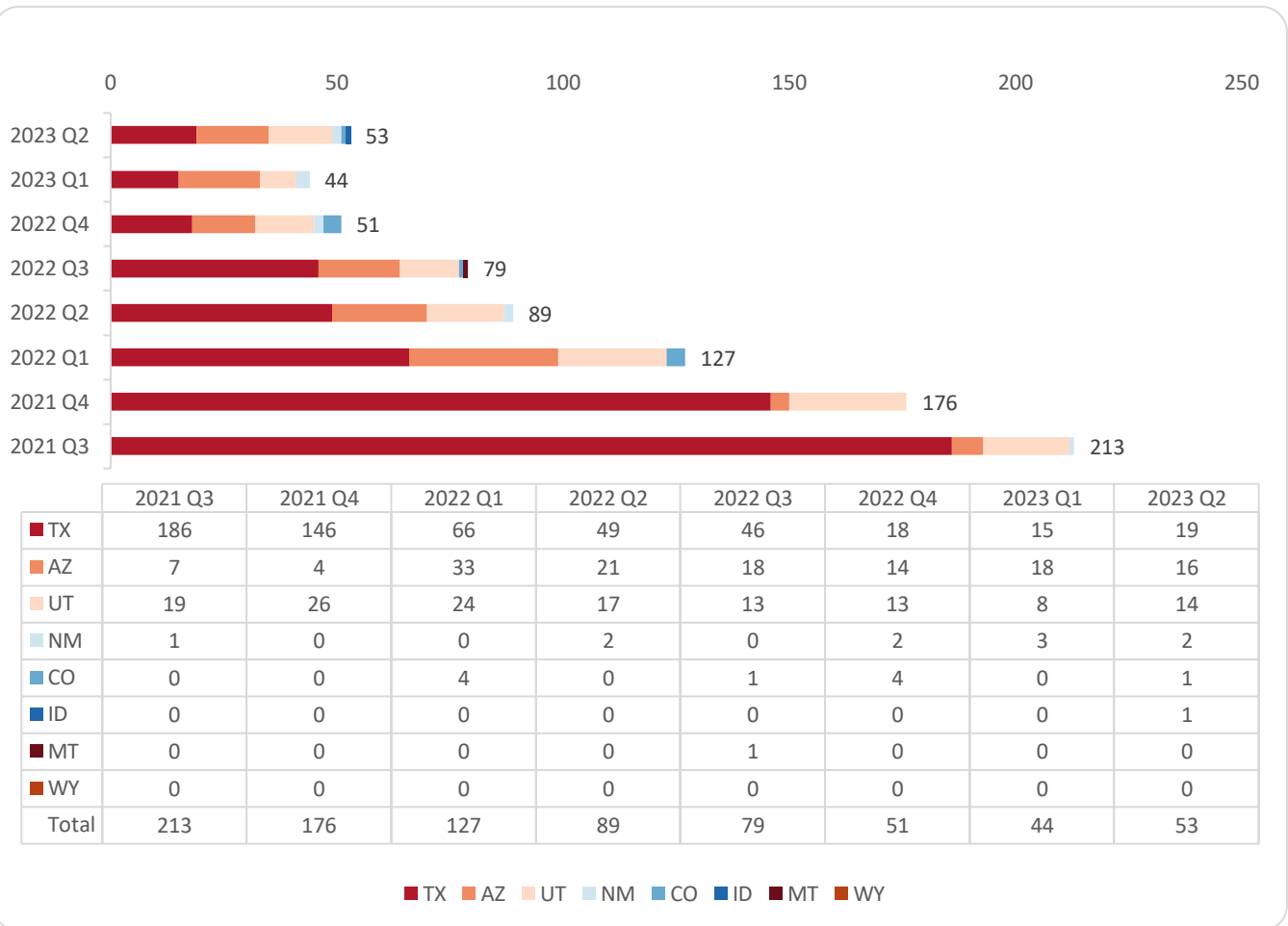
**Total with mechanisms: 231 - 11.16% of submissions**

**Mountain Region positive carbapenemase mechanisms for CP-CRE and CP-CRPA isolates by State—2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**

	ORGANISM NAME	MECHANISM	COUNT
AZ	Citrobacter freundii complex	VIM	1
AZ	Klebsiella pneumoniae	NDM	5
CO	Enterobacter cloacae complex	KPC	2
CO	Enterobacter cloacae complex	NDM	2
CO	Escherichia coli	NDM	1
CO	Klebsiella oxytoca	KPC	5
CO	Pseudomonas aeruginosa	IMP	1
ID	Escherichia coli	NDM	4
ID	Escherichia coli	OXA-48	3
ID	Klebsiella oxytoca	OXA-48	1
ID	Klebsiella pneumoniae	NDM	1
ID	Klebsiella pneumoniae	OXA-48	2
ID	Morganella morganii	IMP	1
ID	Pseudomonas aeruginosa	IMP	2
ID	Pseudomonas aeruginosa	VIM	1
MT	Enterobacter cloacae complex	NDM	1
MT	Escherichia coli	NDM	1
MT	Klebsiella pneumoniae	KPC	1
MT	Klebsiella pneumoniae	NDM	1
NM	Citrobacter freundii complex	KPC	4
NM	Enterobacter cloacae complex	KPC	4
NM	Enterobacter cloacae complex	NDM	3
NM	Escherichia coli	KPC	2
NM	Escherichia coli	NDM	3
NM	Escherichia coli	OXA-48	3
NM	Klebsiella aerogenes	KPC	1
NM	Klebsiella oxytoca	KPC	3
NM	Klebsiella oxytoca	NDM	1
NM	Klebsiella pneumoniae	KPC	5
NM	Klebsiella pneumoniae	NDM	6
NM	Klebsiella pneumoniae	OXA-48	1
NM	Pseudomonas aeruginosa	IMP	1
NM	Pseudomonas aeruginosa	OXA-48	1
NM	Pseudomonas aeruginosa	VIM	7
TX	Citrobacter freundii complex	KPC	3
TX	Enterobacter cloacae complex	NDM	1
TX	Escherichia coli	KPC	1
TX	Escherichia coli	NDM	14
TX	Klebsiella oxytoca	KPC	1

	ORGANISM NAME	MECHANISM	COUNT
TX	Klebsiella oxytoca	NDM	1
TX	Klebsiella pneumoniae	KPC	25
TX	Klebsiella pneumoniae	NDM	3
TX	Klebsiella variicola	NDM	10
TX	Morganella morganii	NDM	1
TX	Pseudomonas aeruginosa	IMP	3
TX	Pseudomonas aeruginosa	KPC	1
UT	Citrobacter freundii complex	KPC	25
UT	Enterobacter cloacae complex	IMP	2
UT	Enterobacter cloacae complex	KPC	2
UT	Enterobacter cloacae complex	NDM	1
UT	Enterobacter cloacae complex	OXA-48	1
UT	Escherichia coli	KPC	2
UT	Escherichia coli	NDM	13
UT	Klebsiella oxytoca	KPC	1
UT	Klebsiella pneumoniae	KPC	16
UT	Klebsiella pneumoniae	NDM	4
UT	Proteus mirabilis	VIM	1
UT	Providencia rettgeri	IMP	1
UT	Providencia stuartii	IMP	2
UT	Pseudomonas aeruginosa	IMP	1
UT	Pseudomonas aeruginosa	VIM	11
WY	Enterobacter cloacae complex	KPC	1
WY	Escherichia coli	NDM	2

**Mountain Region isolate submissions targeting CP-CRAB by State and quarter — 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**



Total submissions: **832**

Total with mechanisms: **757 - 90.99% of submissions**

**Mountain Region positive carbapenemase mechanisms for CP-CRAB isolates by State — 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**

	MECHANISM	COUNT
AZ	OXA-23	115
AZ	OXA-235	8
CO	NDM	1
CO	OXA-23	4
CO	OXA-24	1
ID	OXA-23	1
MT	OXA-235	1
NM	OXA-23	8
NM	OXA-24	1
TX	NDM	21
TX	OXA-23	404
TX	OXA-237	2
TX	OXA-24	99
UT	OXA-23	55
UT	OXA-235	32
UT	OXA-237	2
UT	OXA-24	2

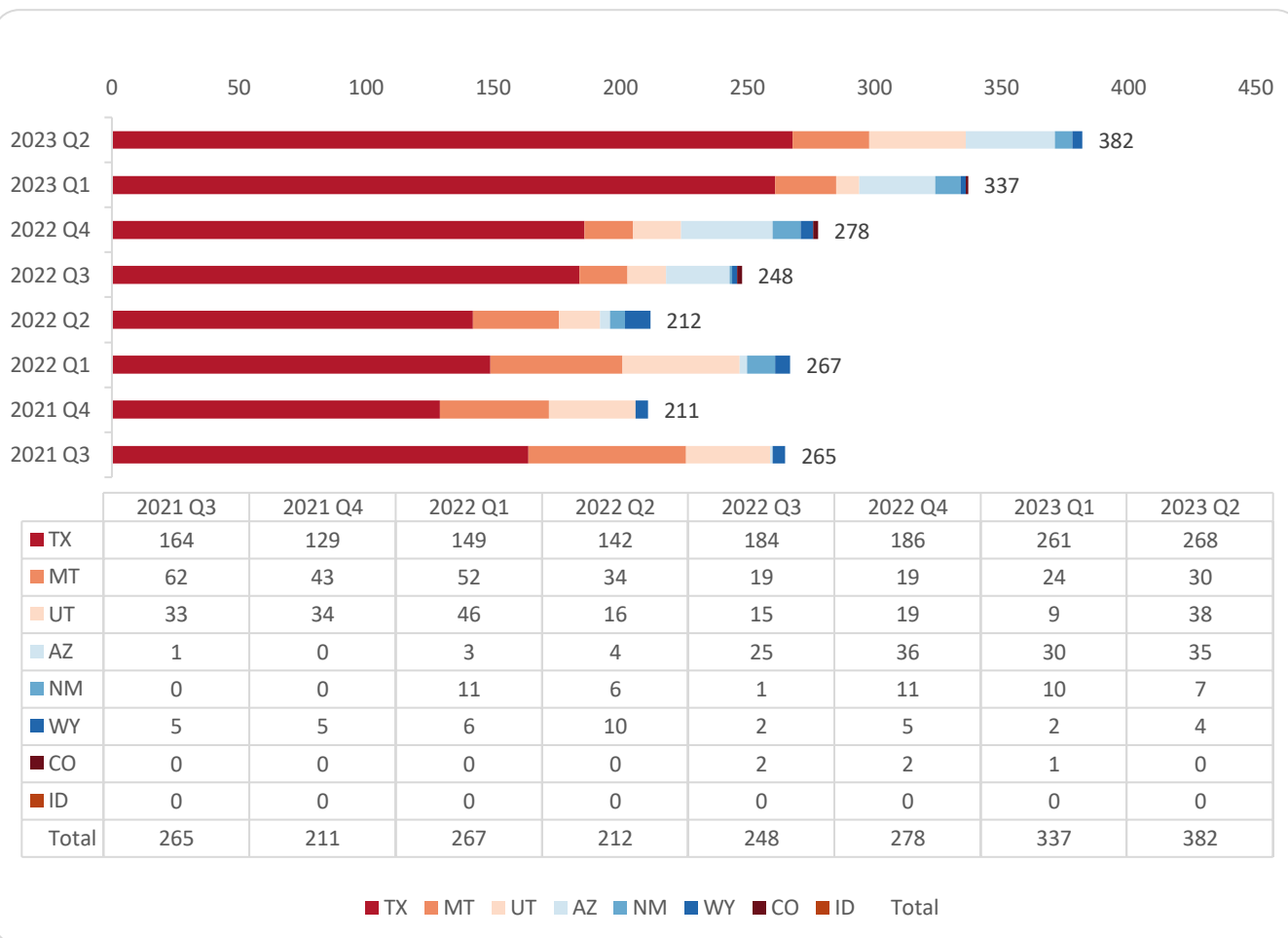
\* OXA-23 mechanisms include OXA-23-like mechanisms: OXA-225, OXA-398, OXA-565, OXA-23

\*\* OXA-24 mechanisms include OXA-24/40-like mechanisms: OXA-139, OXA-72, OXA-207, OXA-160, OXA-24

# Candida non-albicans yeast

## Mountain Region *Candida* total yeast isolate submissions by State — 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)

(Includes *Candida non-albicans* isolates submitted for identification, *Candida auris* rule-out, and antifungal susceptibility testing)

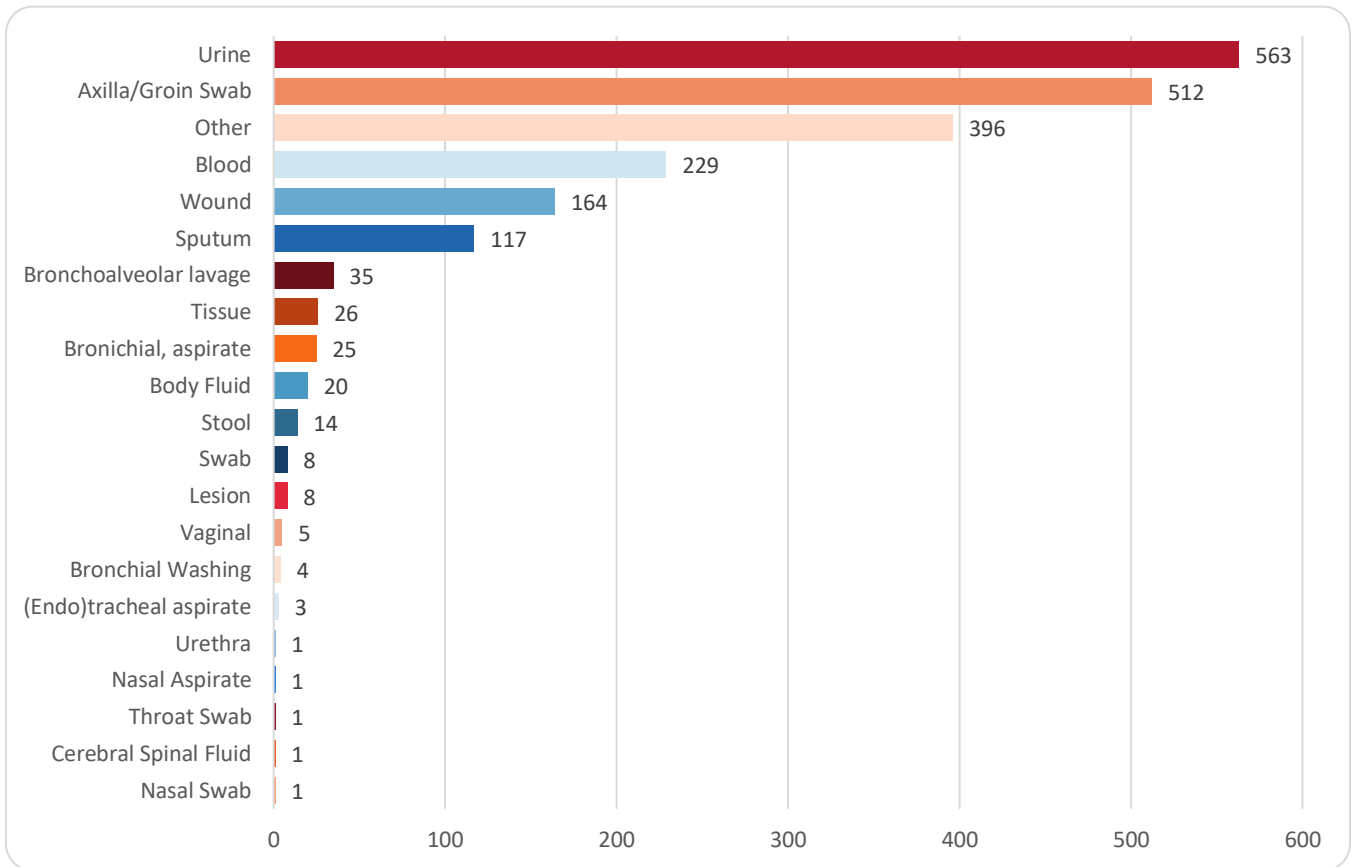


Total submissions: **2,200**



Candida non-albicans yeast

Mountain Region *Candida* yeast isolate\* submissions by source— 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)



Total: **2,134**

*\*Includes Candida non-albicans isolates submitted for identification, Candida auris rule-out, and antifungal susceptibility testing*

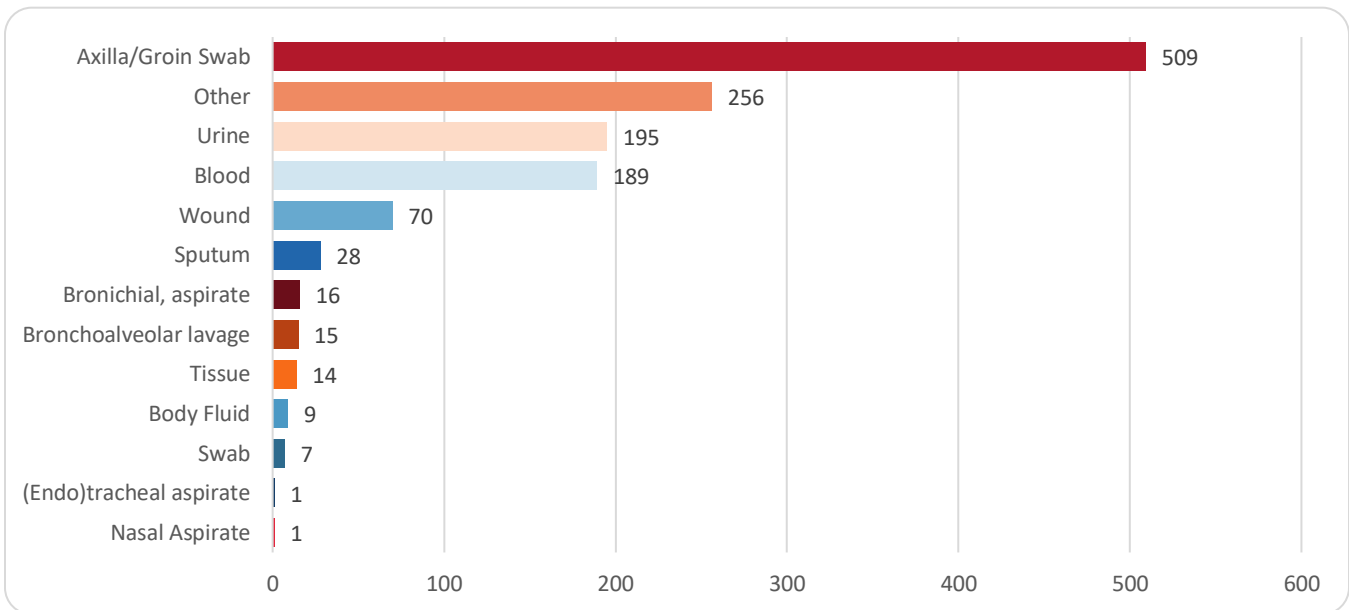
Candida non-albicans yeast

**Mountain Region *Candida non-albicans* yeast isolate submissions by species and State — 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)**

Species	AZ	CO	ID	MT	NM	TX	UT	WY	TOTAL
<i>C. auris</i>	319	5	0	0	1	1256	3	0	1584
<i>C. glabrata</i>	0	0	0	127	22	40	66	17	272
<i>C. parapsilosis</i>	0	0	0	60	2	95	41	12	210
<i>C. tropicalis</i>	0	0	0	21	9	59	21	1	111
<i>C. lusitaniae</i>	0	1	0	18	2	20	16	2	59
<i>C. albicans</i>	0	0	0	0	0	1	36	0	37
<i>C. krusei</i>	0	0	0	11	3	12	2	3	31
<i>C. dubliniensis</i>	0	0	0	21	0	3	1	3	28
<i>C. kefyr</i>	0	0	0	10	1	2	7	1	21
<i>C. orthopsilosis</i>	0	0	0	0	2	13	3	0	18
<i>C. metapsilosis</i>	0	0	0	2	0	8	0	0	10
<i>C. fermentati</i>	0	0	0	2	0	5	0	0	7
<i>C. duobushaemulonii</i>	0	0	0	0	0	5	0	0	5
<i>C. guilliermondii</i>	0	0	0	2	1	1	1	0	5
<i>Saccharomyces cerevisiae</i>	0	0	0	0	1	0	3	0	4
<i>C. intermedia</i>	0	0	0	0	0	2	0	0	2
<i>Magnusiomyces capitatus</i>	0	0	0	0	0	1	1	0	2
<i>C. zeylanoides</i>	0	0	0	1	1	0	0	0	2
<i>Yarrowia (Candida) lipolytica</i>	0	0	0	0	0	0	1	0	1
<i>C. pelliculosa</i>	0	0	0	1	0	0	0	0	1
<i>C. inconspicua</i>	0	0	0	1	0	0	0	0	1
<i>Cyberlindnera fabianii</i>	0	0	0	0	0	0	1	0	1
<i>C. lipolytica</i>	0	0	0	1	0	0	0	0	1
<i>C. sojae</i>	0	0	0	0	0	1	0	0	1
<i>C. pseudohaemulonii</i>	0	0	0	0	0	1	0	0	1

# Candida auris

## Mountain Region \**Candida auris* yeast isolate submissions by source — 2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)



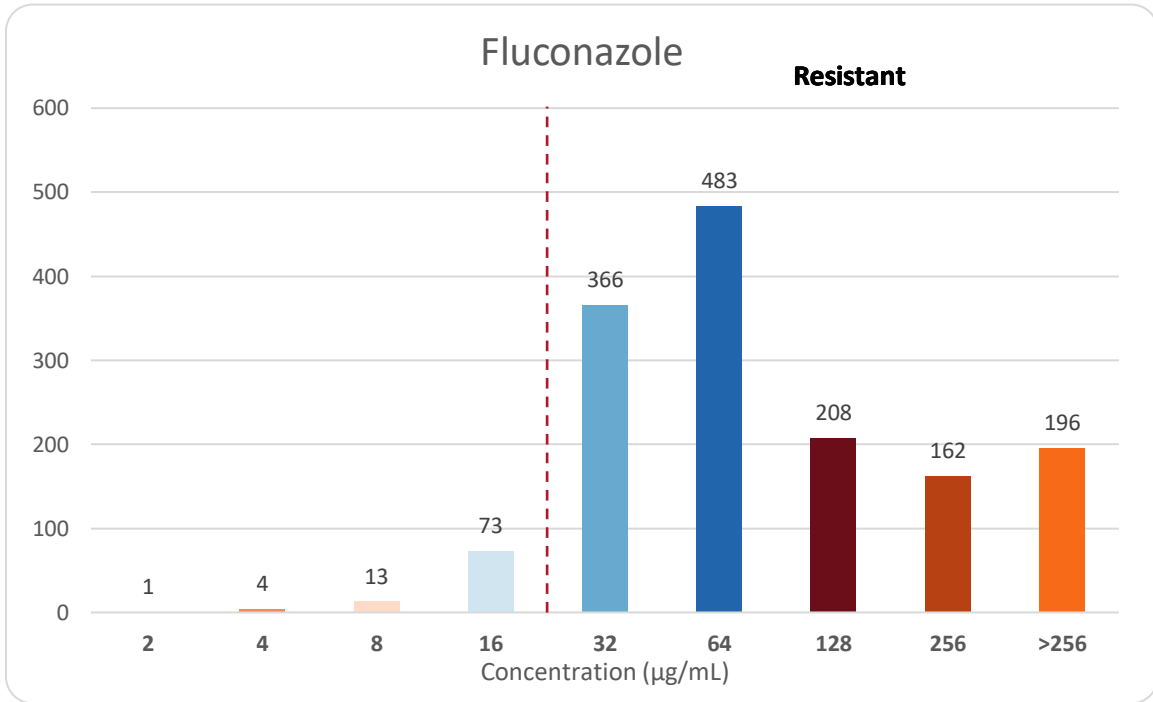
\*Data available on 1,310 *Candida auris* isolates:

For the most recent data on *Candida auris* clinical cases in the United States, please refer to the following website:

<https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>

## Azole Resistance

Mountain Region *Candida auris* yeast isolate submissions and Azole susceptibility profile — 2020 (Q1 – Q4) and 2021 (Q1 – Q2)

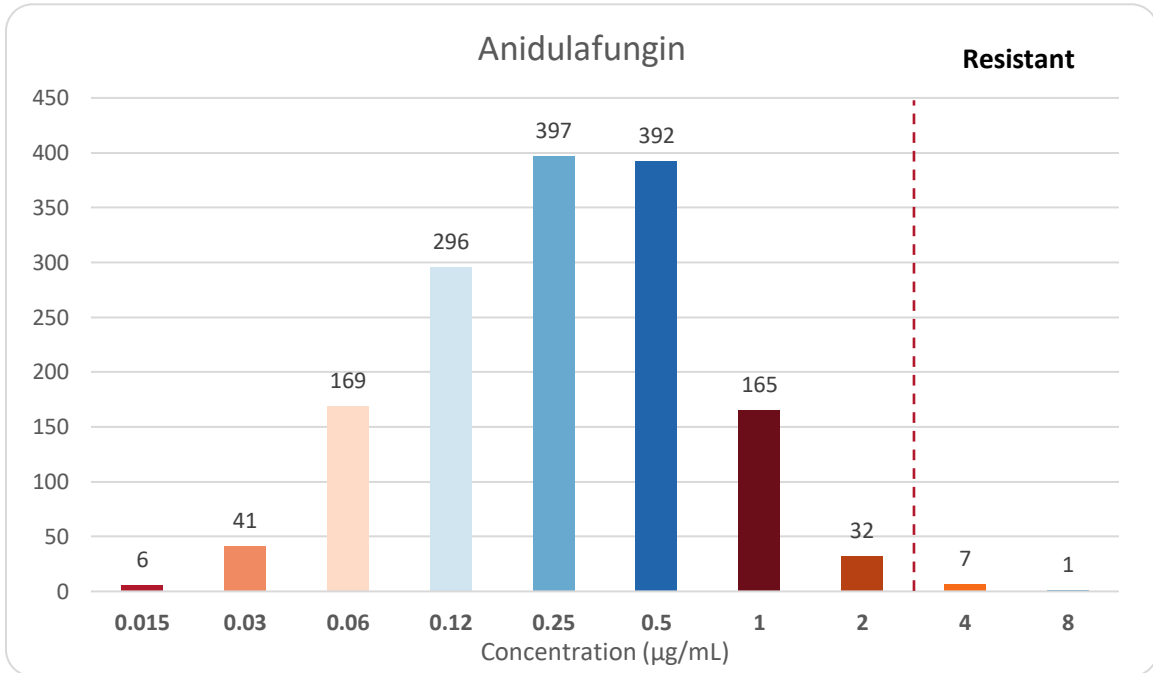


### *Candida auris* isolate Fluconazole resistance totals

	Count	% of Total
<b>Resistant</b>	1415	93.96%
<b>Susceptible</b>	91	6.04%
<b>Total</b>	1506	-

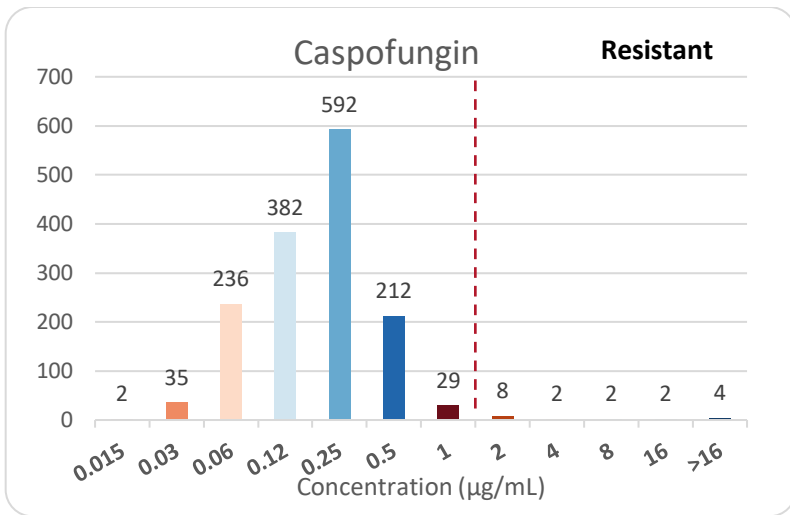
## Echinocandin resistance

Mountain Region *Candida auris* yeast isolate submissions and Echinocandin susceptibility profile—2021 (Q3 – Q4), 2022 (Q1 – Q4), 2023 (Q1 – Q2)

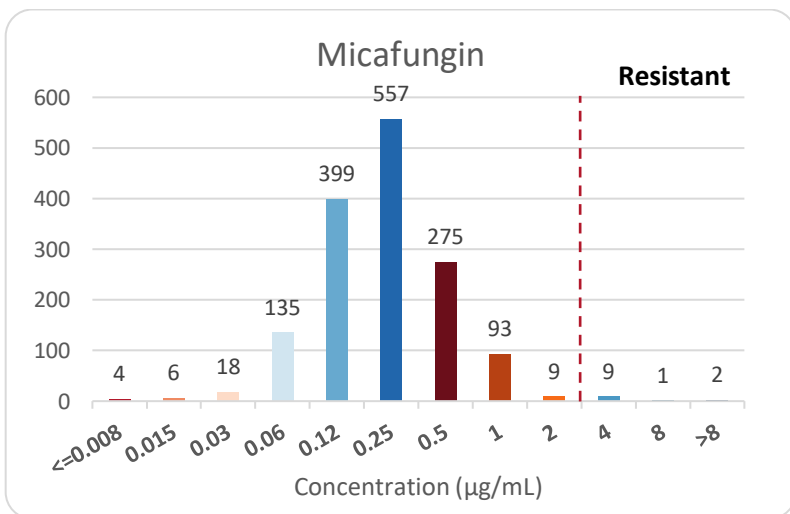


### *Candida auris* isolate Anidulafungin resistance totals

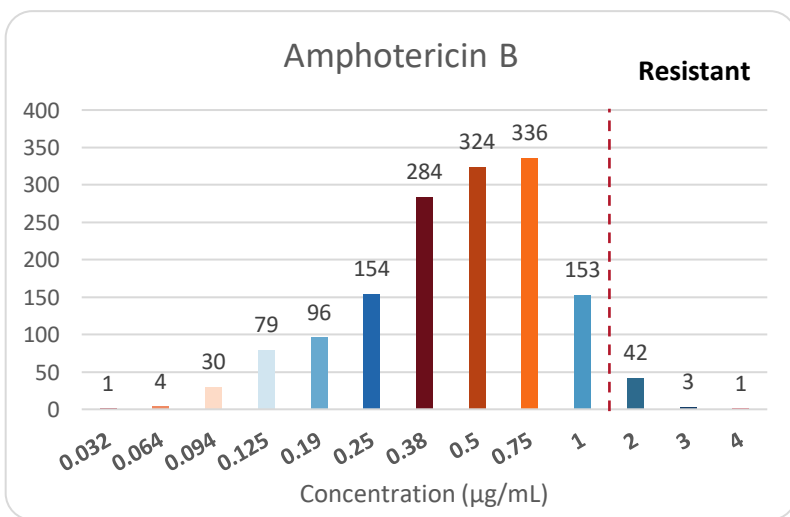
	Count	% of Total
<b>Resistant</b>	8	0.53%
<b>Susceptible</b>	1498	99.47%
<b>Total</b>	1506	-



	Count	% of Total
<b>Resistant</b>	18	1.20%
<b>Susceptible</b>	1488	98.80%
<b>Total</b>	1506	-



	Count	% of Total
<b>Resistant</b>	12	0.80%
<b>Susceptible</b>	1496	99.20%
<b>Total</b>	1508	-



	Count	% of Total
<b>Resistant</b>	46	3.05%
<b>Susceptible</b>	1461	96.95%
<b>Total</b>	1507	100.00%